

Arthroscopic Resection of Distal Pole of the Scaphoid for Scaphotrapeziotrapezoid Joint Arthritis: Comparison between Simple Resection and Implant Interposition

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Abstract

Background Isolated scaphotrapeziotrapezoid is a relatively rare condition, and there is still not complete consensus on the treatment of this pathology.

Purpose The aim of the present study is to assess the utility of implant interposition after arthroscopic scaphoid distal pole resection for scaphotrapeziotrapezoid arthritis.

Material and Methods The authors present a prospective study after the arthroscopic resection of the distal pole of the scaphoid in 24 patients. In a group of 11 patients, the simple resection was performed while in the other 13 patients the scaphoid resection and pyrocarbone implant interposition.

Results All patients were clinically evaluated with disability of arm, shoulder, hand score. Dorsal intercalated segment instability deformity was also measured from X-ray analysis. Grip and pinch strength were measured too, and patients were also given a visual analog scale questionnaire. Both clinical and radiographic assessments were done at 24 months postoperatively.

Conclusions The study showed comparable results with both the techniques.

Level of Evidence II A prospective comparative study.

Keywords

- scaphotrapeziotrapezoid
- arthroscopy
- arthritis
- implant
- pyrocarbon

Scaphotrapeziotrapezoid joint (STT) arthritis represents 13% of arthritis in the hand.¹ Its classical clinical presentation consists of pain on the radial side of the wrist, swelling, and tenderness over the STT joint. Limitation of the thumb range of motion due to pain can occur, especially during thumb abduction and opposition. Grip strength reduction is often present too. It might be associated with flexor carpi radialis tendosynovitis or with a palmar ganglion cyst.² There is a higher incidence after the fourth decade. It is not uncommonly misdiagnosed as arthritis of the first carpometacarpal joint arthritis. Both conservative and surgical treatment has been proposed. Conservative treatment consists of night splinting with a thumb spica splint, nonsteroidal anti-inflammatory drugs, and physical therapy. Surgical options include

silicone implants,³ STT arthrodesis,^{4,5} resection arthroplasties^{6,7} associated or not to tendon or capsular interposition,^{8,9} and prostheses or spacer were also suggested.^{10–12}

Arthroplasty of the STT joint with or without a prosthetic spacer has been previously described by both open and arthroscopic surgery, to prevent the dorsal intercalated segment instability (DISI) deformity that follows to the distal resection of the scaphoid.

The present nonrandomized prospective study has been developed to compare the functional result of two groups of patients affected by STT arthritis operated by an arthroscopic arthroplasty with and without prosthetic interposition. The further aim of the study was to analyze the radiographic alignment of the carpal bones after a distal

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pole resection to determine if this influenced the incidence of a DISI deformity.

Materials and Methods

From 1999 to 2007, 24 patients with an isolated STT arthritis were treated by an arthroscopic resection of the distal pole of the scaphoid. The patients belonged to two consecutive groups.

In group A, 11 patients underwent a simple arthroscopic resection of the distal pole of the scaphoid by the last author (R. L.), while in the group B, 13 patients were treated with a pyrocarbon interposition implant (STPI, BIOprofile, Montbonnot-Saint-Martin, France) after the resection of the distal pole of the scaphoid by the first author (L. P.).

In group A, there were seven females and four males, with an average age of 64.8 years (range, 63–68 years). In seven cases the right hand was involved, while in four cases the left one. Radiological aspect of the STT joint was staged according to Crosby classification¹ (see ►Table 1): six hands were in stage III, three hands in stage II, and two hands in stage I.

In group B, there were 13 patients, with 9 females and 4 males, with an average age of 57.2 years (range, 51–65 years). The right hand was involved in nine cases, while in four the left hand was involved. There were six hands in stage III, four hands in stage II, and two hands in stage I.

Before surgery, all of the patients underwent a trial of conservative treatment consisting of the use of a static thumb spica night splint and nonsteroidal anti-inflammatory drugs for 2 months. Conservative treatment failed in all cases. Clinical evaluation of the patients was done preoperatively and at 24 months after surgery. Functional hand examination included grip strength with a Jamar hydraulic hand dynamometer (Patterson Medical, Warrenville, IL), pinch strength using a Jamar hydraulic pinch gauge, range of motion using Kapandji test^{13–15} and pain evaluation according to a 10-point visual analog scale (VAS). The DASH questionnaire (disability of arm, shoulder, hand) together with a VAS questionnaire were also administered to the patients before and after surgery (24 months) to evaluate the clinical satisfaction.

Radiological examination of the wrist, by using standard anteroposterior and lateral X-ray views was performed preoperatively, at 1 week and at the last follow-up for each patient (►Fig. 1).

Table 1 Crosby classification for scaphotrapeziotrapezoid arthritis

Stage 0	No radiological signs of arthritis
Stage 1	Radiological signs of arthritis with conservation of the articular space
Stage 2	Hardly visible articular line
Stage 3	Presence of erosions, scleroses, and irregularity of the articular interline space

The scapholunate angle was also measured on a lateral X-ray view preoperatively and at 2 years follow-up searching for any sign of DISI deformity progression in both groups, according to the method described by Smith et al.¹⁶

The final data obtained from the two groups were analyzed using the Mann–Whitney U-test.

Surgical Technique

All of the patients were treated under brachial plexus anesthesia and tourniquet control. The first step of the procedure was the arthroscopic resection of the distal pole of the scaphoid and it was the same for both groups. The standard following procedure was used. With the thumb suspended in 2 kg traction in Chinese finger traps, a two-portal approach to the STT joint was used. Both portals were located dorsally at the level of the midcarpal row—one ulnar to the tendons of the first compartment and the other radial to the tendons of the third compartment, as described by Baré et al.¹⁷ A 1.9-mm arthroscope was used in each case. Any synovitis was debrided using a 2.5-mm full radius shaver to gain a better view of the joint and to evaluate the cartilage damage (►Fig. 2). A resection of at least 3 to 4 mm of the distal pole of the scaphoid was then performed using a 2.5-mm burr and occasionally a 3.5-mm burr.

Great care was taken to preserve as much as possible of the main ligament system of the joints, such as the scaphotrapezial and scaphocapitate ligaments, being these two the most important to avoid a DISI deformity.¹⁸ In group A, the portals were then closed with steri strips and a compressive bandage was applied. In group B, a slight slope was created from the radial side to the ulnar side of the bone to minimize the chance of dislocation of the implant. The two arthroscopic portal incisions were then joined by a small transverse incision and the appropriate size prosthesis was chosen with the help of a template and then placed into the STT space. Intraoperative testing to assess the proper positioning of the spacer was performed without traction.

The same postoperative rehabilitation protocol was used for both groups.

The same day or the day after the surgical procedure, a static thermoplastic removable splint which included the wrist and the metacarpophalangeal joint of the thumb was applied. The splint was worn continuously for 3 weeks during which time the patient was instructed to perform active exercises to control edema, this exercise included long finger flexion–extension exercise and flexion–extension of the interphalangeal joint of the thumb. At 3 weeks after the surgery a removable splint, which is similar to the one described above, was applied and gentle active and passive mobilization of the base of the thumb and wrist was allowed. Strengthening exercises started at 4 weeks postoperative. On average the removable splint was used for an additional 3 weeks.

Results

The average follow-up was 24.2 months (range, 21–26 months) for all the patients. All of the patients returned to



Fig. 1 Radiographs of a patient affected by STT arthritis: (A) Anteroposterior projection and (B) oblique projection. STT, scaphotrapezotrapezoid joint.

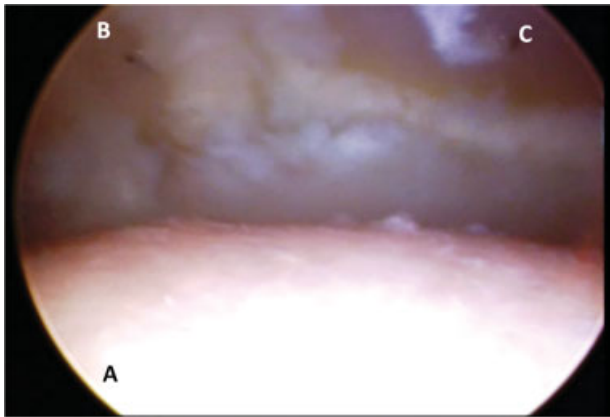


Fig. 2 Arthroscopic view of the STT joint: (A) Scaphoid distal pole; (B) trapezium; and (C) trapezoid. Please note the severe cartilaginous lesion observed during the procedure. STT, scaphotrapezotrapezoid joint.

their normal daily activities within 3 months and all reported a functional improvement of their hand.

As regards group A, the preoperatively average grip strength was 24.4 kg (range, 18–30 kg) and postoperatively it improved to 34.9 kg (range, 27–41 kg). The pinch grip strength was 10.2 kg (range, 5–12 kg) preoperatively and 13.3 kg (range, 6–14 kg) postoperatively. The preoperatively VAS pain score averaged 8.2 (range, 4–10) at rest and 9.1 (range, 6–10) under load and postoperatively 4.3 (range, 2–5) at rest and 5.4 (range, 3–7) under load, respectively. The Kapandji score averaged 7.2 (range, 5–8) preoperatively and 9.0 (range, 8–10) postoperatively.

According to the DASH questionnaire evaluation, the preoperatively mean value score was 78.4 (range, 60–108) and postoperatively was 25.9 (range, 11–53).

The measured scapholunate angle was 54.1 on average preoperatively (range, 40–78 degrees) and increased to 58.7 (range, 42–86 degrees) at the final follow-up.

Concerning group B, the preoperatively and postoperatively average grip strength was 27.3 kg (range, 21–32 kg) and 36.9 kg (range, 28–48 kg), respectively. The pinch grip strength was 8.2 kg (range, 5–11 kg) preoperatively and 13.8 kg (range, 7–15 kg) postoperatively. The preoperatively and postoperatively VAS pain score averaged 7.7 (range, 5–9) at rest and 9.4 (range, 6–10) under load and 4.6 (range, 2–7) at rest and 5.6 (range, 4–7) under load, respectively. The Kapandji score averaged 7.2 (range, 6–9) preoperatively and 9.1 (range, 7–10) postoperatively.

The preoperative mean DASH score was 67.8 (range, 49–92) and postoperatively 39.4 (range, 31–55).

The scapholunate angle was 51.8 degrees on average preoperatively (range, 44–64 degrees) and increased to 54.7 (range, 46–68 degrees) at the final follow-up. No relevant statistical difference was found between the two groups using the Mann-Whitney U-test ($p \leq 0.05$). Results can be found in ►Table 2.

Statistical analysis has been summarized in ►Table 3. The statistical analysis shows no significant difference as expected between the two samples before the operation. Significant improvement of grip strength, pinch strength, DASH score, and Kapandji score was observed in both the groups after the surgery. VAS score just had a significant improvement in group B. No significant difference was found on the VAS score under load between the two groups after the procedure. The only significant difference found between the two groups regarding the pinch strength, which seems better in group A.

Discussion

Arthritis of the STT joint is an often asymptomatic condition which can lead, in its advanced stages, to an important impairment of hand function. Conservative treatment rarely is successful due to the difficulty in isolating this joint with a

Table 2 Scapholunate angle measurements at mean 24 months follow-up in groups A and B

DISI evaluation				
Patient	Group A		Group B	
	Preoperative	Postoperative	Preoperative	Postoperative
1	78	86	49	55
2	59	61	48	52
3	40	42	51	53
4	55	47	47	48
5	54	59	50	51
6	57	61	48	50
7	55	58	55	58
8	52	55	54	56
9	48	60	61	68
10	54	59	64	65
11	43	58	52	56
12			50	53
13			44	46
Mean	54.1	58.7	51.8	54.7

Abbreviation: DISI, dorsal intercalated segment instability.

splint as well as in teaching patients the correct ergonomic education.

For this reason, we believe that in advanced and painful stage of STT joint arthritis a surgical approach has to be considered to relieve symptoms and restore a normal hand function.

Concerning surgical treatment not many options are available compared with other degenerative changes of the carpal bones, such as osteoarthritis of the first carpometacarpal bones. Arthrodesis or distal pole scaphoid resection associated or not with other procedures, are the mainly used options. The former has a high rate of nonunion and great care must be taken in the proper positioning of the bones (especially the scaphoid) and besides, it needs a secondary surgical procedure for fixation removal.¹⁹ It should be also mentioned that following such procedure the radioscapoid joint could also develop secondary arthritis due to the scaphoid reduced range of motion, therefore, in our opinion this procedure does not represent a valuable choice. What represents a valuable choice for us is the resection of the scaphoid distal pole that allows a prompt pain relief and a fast return to normal activities.

Another important consideration that has to be made is about the arthroscopic approach that has been adopted in this series. Usually, the STT joint arthroplasty is performed with a traditional open approach and not under arthroscopy as in this case.²⁰ The traditional procedure is relatively simple and reliable, but do not give the same view as the arthroscopic one. The open technique showed good results, comparable in the long term with the one we proposed, but in the short term, it seems that the arthroscopic technique is slightly better and allows to perform a better resection of the distal

pole of the scaphoid, especially on the anterior portion that cannot be visualized as well during a traditional open arthroplasty procedure. The implement of the volar-radial portal as described previously by Carro et al²¹ allows a good vision on the anterior portion of the scaphoid distal pole that cannot be achieved with the traditional approach.

The choice between the simple arthroplasty and the association with an implant positioning is still debated. The results show that both groups benefit from the procedure, as proved by the improvement of the grip strength and pinch strength. The improvement recorded in this study has statistical relevance ($p \leq 0.05$), while there is no statistical evidence of the superiority of one group on the other, although we observed slightly better results in the group treated with the implant interposition.

The same situation has been observed while analyzing the VAS score, the DASH score, and the Kapandji score. The results improve from the preoperative evaluation to the postoperative evaluation, but no statistical differences were found comparing the two groups. It has to be noted that the DASH score is the only parameter that, even without statistical evidence, was better in the group treated without the implant interposition. This evidence is not widely accepted in the published literature. Low and Edmunds¹¹ published a series where their results, obtained with nonarthroscopic implant interposition, were compatible with the results we obtained without the interposition, although these results were obtained on a smaller series. It is the opinion of the authors, also based on previous studies¹² that this phenomenon is mainly due to the lack of larger prospective studies on this topic. All the studies considered in this article shows comparable results between the preoperative condition and

Table 3 Results of the statistical analysis on the measurements collected at mean 24 months follow-up in groups A and B

	A preop vs. A postop	B preop vs. B postop	A preop vs. B preop	A postop vs. B postop
Grip	10 (critical < 30) significant	29 (critical < 37) significant	38 (critical < 33) nonsignificant	55 (critical < 33) nonsignificant
Pinch	10 (critical < 30) significant	12.5 (critical < 37) significant	39.5 (critical < 33) nonsignificant	20 (critical < 33) significant
VAS score	48 (critical < 30) nonsignificant	19.5 (critical < 37) significant	43 (critical < 33) nonsignificant	62.5 (critical < 33) nonsignificant
VAS score (under load)	34 (critical < 30) nonsignificant	51 (critical < 37) nonsignificant	50 (critical < 33) nonsignificant	60 (critical < 33) nonsignificant
Kapandji score	15 (critical < 30) significant	20 (critical < 37) significant	66 (critical < 33) nonsignificant	62 (critical < 33) nonsignificant
DASH score	0 (critical < 30) significant	22.5 (critical < 37) significant	50 (critical < 33) nonsignificant	40 (critical < 33) nonsignificant
S-L angle value	33 (critical < 30) nonsignificant	55.5 (critical < 37) nonsignificant	56.5 (critical < 33) nonsignificant	45.5 (critical < 33) nonsignificant

Abbreviations: DASH, disabilities of the arm, shoulder, and hand; preop, preoperative; postop, postoperative; VAS, visual analog scale.

Note: The table expresses the U-value obtained after Mann-Whitney test. Significant differences were displayed using bold characters ($p \leq 0.05$).

the postoperative condition, and the difference between different procedures is probably too narrow for this series.

Another interesting data have been provided by the radiographic evaluation and the DISI deformity evaluation. The average value of the scapholunate angle varies between 72 degrees in full wrist flexion and 35 degrees in full wrist extension.²² In our study, we calculated the scapholunate angle on plain radiographs with the wrist in a neutral position on a lateral view. Three patients had a preoperative scapholunate value that was higher than 60 degrees, one was in group A and two were in group B. Postoperatively the mean scapholunate angle value improved in both groups, slightly more in group A even if without any statistical relevance between the two groups, and in the same group there were two cases where the value improved over 60 degrees postoperatively. Any of the patients reported a reduction of the scapholunate angle value. The results are shown in ►Table 1.

Resection of the distal pole of the scaphoid, associated or not to an implant interposition, can be effective in relieving pain but a secondary DISI has been advocated. Our data reveal no statistical significant difference in the scapholunate angle after our follow-up period between the two groups.

In our opinion, arthroscopic resection of the distal pole of the scaphoid, with and without implant, represents an excellent treatment option for this condition. The implant interposition might furthermore tight the stabilizing ligament of the STT joint giving more stability to the joint itself. The use of arthroscopy allows a less aggressive approach to the joint.

The main limitation of this study is the number of cases studied and the relatively short follow-up.

We do agree that a longer follow-up and wider number of cases are needed to evaluate if a difference between the two groups might appear with time.

Note

Patients were treated in San Pio X Clinic, Milan, Italy, and Rimini Center for Hand Surgery, Rimini, Italy, as well as data collection. Analysis was performed at San Pio X Clinic, Milan, Italy.

Conflict of Interest

None.

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